Factors associated with mortality among individuals who tested positive for SARS-CoV-2 in Orange County

For simplicity let
O_i be the odds of mortality among individuals who tested positive for SARS-CoV-2 in Orange County.
$\overrightarrow{\beta}_{\text{Race/ethnicity}} = (\beta_{\text{Asian}}, \beta_{\text{Black}}, \beta_{\text{Hispanic}}, \beta_{\text{Native American}}, \beta_{\text{Pacific Islander}}, \beta_{\text{Unknown}})$
$\overrightarrow{\beta}_{\text{College}} = (\beta_{\text{\% with College Degree Quartile 2}}, \beta_{\text{\% with College Degree Quartile 3}}, \beta_{\text{\% with College Degree Quartile 4}})$
$\overrightarrow{\beta}_{\text{Insurance}} = (\beta_{\text{\% with Insurance Quartile 2}}, \beta_{\text{\% with Insurance Quartile 3}}, \beta_{\text{\% with Insurance Quartile 4}})$

Model 0:

$$\begin{aligned}\log(O_i) = \beta_0 &+ \beta_{\text{Age}}\text{Age}_i + \beta_{\text{Gender}}\text{Gender}_i + \overrightarrow{\beta}_{\text{Race/ethnicity}}\overrightarrow{\text{Race/ethnicity}}_i \\ &+ \overrightarrow{\beta}_{\text{College}}\overrightarrow{\text{\% with College Degree Quartile}}_i \\ &+ \overrightarrow{\beta}_{\text{Insurance}}\overrightarrow{\text{\% with Medical Insurance Quartile}}_i \\ &+ \beta_{\text{Population Density}}\text{Population Density}_i + \beta_{\text{House Crowding}}\text{House Crowding}_i \\ &+ \beta_{\text{Median Income}}\text{Median Income}_i + \beta_{\text{Time}}\text{Time}_i \\ &+ \beta_{\text{\% Hospital Beds Available}}\text{\% Hospital Beds Available}_i,\end{aligned} \tag{1}$$

without a random intercept for zip code.

Model 1:

$$\begin{aligned}\log(O_i) = \beta_0 &+ \beta_{\text{Age}}\text{Age}_i + \beta_{\text{Gender}}\text{Gender}_i + \overrightarrow{\beta}_{\text{Race/ethnicity}}\overrightarrow{\text{Race/ethnicity}}_i \\ &+ \overrightarrow{\beta}_{\text{College}}\overrightarrow{\text{\% with College Degree Quartile}}_i \\ &+ \overrightarrow{\beta}_{\text{Insurance}}\overrightarrow{\text{\% with Medical Insurance Quartile}}_i \\ &+ \beta_{\text{Population Density}}\text{Population Density}_i + \beta_{\text{House Crowding}}\text{House Crowding}_i \\ &+ \beta_{\text{Median Income}}\text{Median Income}_i + \beta_{\text{Time}}\text{Time}_i \\ &+ \beta_{\text{\% Hospital Beds Available}}\text{\% Hospital Beds Available}_i,\end{aligned} \tag{2}$$

with a random intercept for zip code.

Table 1: Model comparison using BIC shows do real difference in modeling odds of mortality given tested positive for SARS-CoV-2 in Orange County. Therefore the simpler model, Model 0, was chosen.

	Degrees of Freedom	BIC
Model 0	20	6449.691
Model 1	21	6460.330

Table 2: Model 0 regression estimation of adjusted odds ratio of mortality given tested positive for SARS-CoV-2 in Orange County.

	Counts		Adjusted Odds Ratio*
	COVID-19 Deaths	Total	with (95% CI†)
Age (decades)			2.559 (2.45, 2.67)
Gender			
Female	450 (43.35%)	21694 (51.19%)	Reference
Male	588 (56.65%)	20689 (48.81%)	2.004 (1.73, 2.31)
Race/ethnicity			
White	345 (33.24%)	6390 (15.08%)	Reference
Asian	186 (17.92%)	1963 (4.63%)	1.54 (1.23, 1.93)
Black	15 (1.45%)	322 (0.76%)	1.063 (0.56, 2.02)
Hispanic	92 (8.86%)	3874 (9.14%)	1.046 (0.79, 1.38)
Native American	3 (0.29%)	34 (0.08%)	1.459 (0.46, 4.58)
Pacific Islander	3 (0.29%)	130 (0.31%)	0.713 (0.22, 2.26)
Unknown	394 (37.96%)	29670 (70%)	0.469 (0.4, 0.55)
% with College Degree‡			
1st Quartile	656 (63.2%)	23221 (54.79%)	Reference
2nd Quartile	190 (18.3%)	10223 (24.12%)	0.67 (0.52, 0.86)
3rd Quartile	155 (14.93%)	5691 (13.43%)	0.765 (0.54, 1.08)
4th Quartile	37 (3.56%)	3248 (7.66%)	0.508 (0.31, 0.84)
% with Insurance			
1st Quartile	566 (54.53%)	21989 (51.88%)	Reference
2nd Quartile	281 (27.07%)	11097 (26.18%)	1.037 (0.83, 1.29)
3rd Quartile	123 (11.85%)	5185 (12.23%)	1.355 (0.95, 1.93)
4th Quartile	68 (6.55%)	4112 (9.7%)	0.79 (0.52, 1.2)
Population Density (1000ppl/km^2)			0.829 (0.71, 0.96)
House Crowding			1.035 (1.02, 1.05)
Median Income (std. dev.)			0.858 (0.7, 1.05)
Time (std. dev.)			0.678 (0.62, 0.75)
COVID ICU patients (std. dev.)			1.184 (1.05, 1.34)

* Model intercept represents odds of death for a white female diagnosed with SARS-CoV-2 in the 0 to 4 age group in a zip code in the first quartile of college degree and insured with the average population density and average number of ICU beds filled with COVID patients in Orange County. The odds of this individual testing dying is estimated to be 0 (0,0)

† 95% confidence interval computed with robust standard errors

‡ The esimated percent of people with a bachelor's degree, and similarly the estimated percent of people with medical insurance, in an individual's zip code

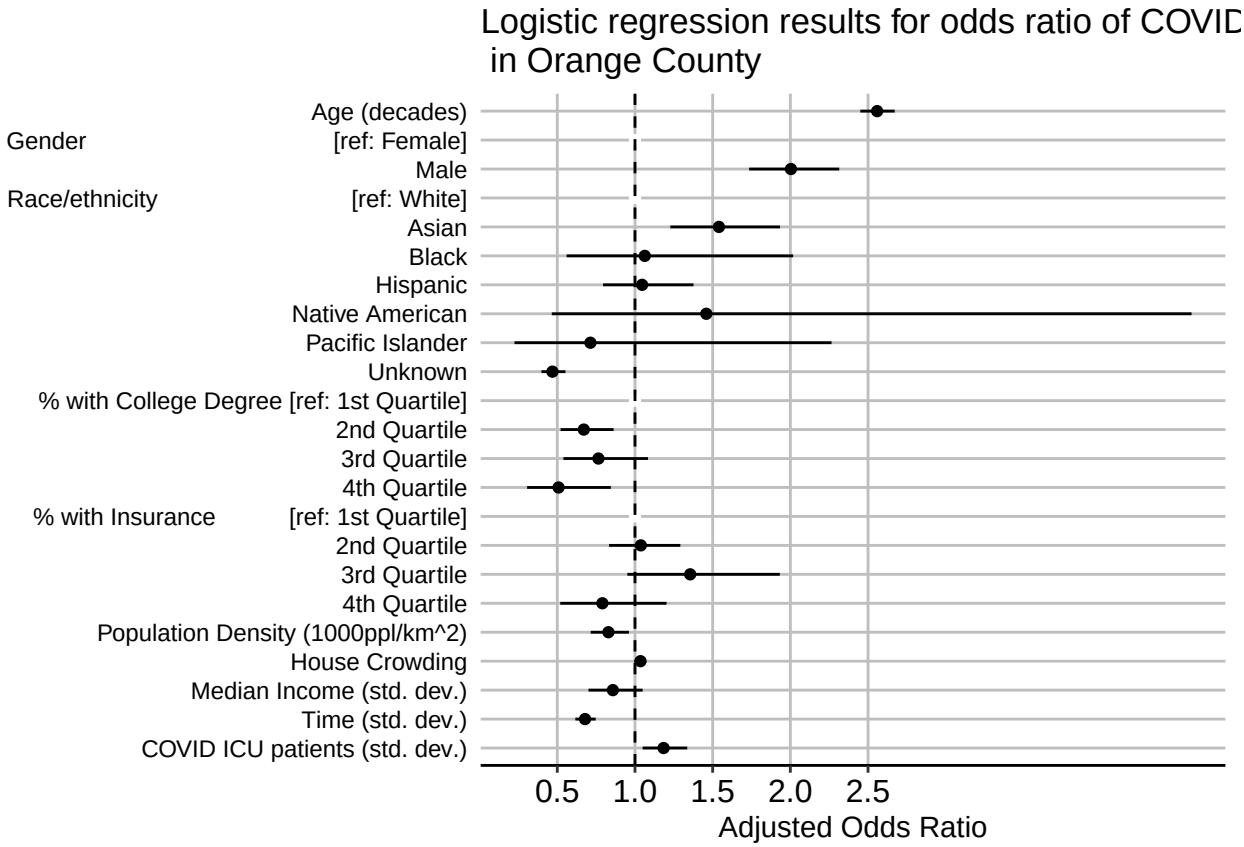

Figure 1: Logistic model 0 results for odds of mortality among individuals who tested positive for SARS-CoV-2 in Orange County.